1216009

PATENT SPECIFICATION

(11) 1216009

DRAWINGS ATTACHED

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(54) IMPROVEMENTS IN OR RELATING TO CONTAINERS

(71) I, AUGUST HEINS, a German Citizen, personally responsible partner of the firm HUDER MUEHLENBAU MASCHINENFABRIK UND APPARATEBAU AUGUST HEINS of 2872 Hude, Oldberg, Germany, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a container for transporting in bulk, products in the form of flowable solids such as grain, fodder, flour, pellets, or the like on vehicles, having an arrangement for emptying the container by means of compressed air.

A container as hereinbefore described is known which is emptied by air blown into the bottom thereof. The air entrains the flowable solid and conveys the mixture of flowable solid and air out of a discharge pipe. However, this apparatus is suitable only for flowable solids which are powdered or fine-grained. In the case of coarser commodities, the air takes its path through the relatively large spaces between the individual solid particles without entraining and conveying the product further. The invention is to provide a container which is constructed so that even coarse grained products can be discharged by air.

According to the present invention there is provided a container for transporting, in bulk, products in the form of flowable solids such as grain, fodder, flour, pellets or the like on vehicles, and having an arrangement for emptying the container with the aid of compressed air, comprising at least one reticulate floor member provided with air flow-through openings, an air injection pipe and a discharge pipe, the container having a top in the form of a horizontally disposed cylinder and having a bottom in the form of a downwardly drawn truncated cone which is "V" shaped in any vertical section through the central axis thereof.

This shape provides a container of great volume which is pressure-resistant and can therefore be manufactured from relatively thin-walled material. The special construction of the bottom part of the container additionally ensures that, during discharge, the product slides downwardly on to the floor members without stoppage.

Two or even more floor members can be provided according to the length of the container. The air flow-through openings can be provided with air deflectors for direction control. The air deflectors may be in the form of slots, tubes, Venturi nozzles, or the like, provided that only the air is thereby concentrated into an air jet guided in the desired direction. The air deflectors may also be arranged on both sides of the longitudinal axis of the floor member and extend at an acue angle to the longitudinal axis. The concentration of the air zone forming above the floor member during the blowing operation is effected particularly by this later alignment of the air deflectors, i.e. in the region of the longitudinal axis of the floor member whereby the maximum air flow forms above the longitudinal axis where the maximum discharge of the product is effected.

In accordance with another development of the invention, the floor member can be assembled from transverse ribs of sheet metal which overlap each other and commonly form narrow air flow-through slots in the region of overlapping.

In accordance with a further development of the invention, air flow-through openings through which air is blown into the granular product from the front end are arranged above the floor member on the air inlet side. Thus, the product is pre-loosened in a higher region above the floor member.

Finally, a flap pivotable about a hori-

zontal axis can be arranged below the outlet opening and connected to a second flap which is arranged at an obtuse angle thereto and which opens an air outlet opening for introducing accelerating air into mixture of product and air emerging from the outlet opening. This is advantageous in that, as the container outlet opening increasingly opens, accelerating air is at the same time increasingly blown through the air outlet opening.

The present invention will now be further described, by way of example, with reference to the accompanying drawings which illustrate a few embodiments of the present invention and in which:—

Fig. 1 illustrates two containers mounted adjacent to each other on a common base frame,

Fig. 2 is a side view of a container illustrated in Fig. 1,

Fig. 3 is a plan view of the discharge connection piece of one of the containers,

Fig. 4 and Fig. 5 illustrate further possibilities for arranging the floor members,

Fig. 6 is an enlarged section through a special construction of the floor members,

Fig. 7 illustrates another embodiment of the floor members arranged in the container,

Fig. 8 is an enlarged longitudinal section through the floor members illustrated in Fig. 7,

Fig. 9 is a sectional view taken on the line IX—IX in Fig. 8,

Fig. 10 is an enlarged longitudinal section through a different embodiment of the floor members,

Fig. 11 is a section taken on the line XI—XI in Fig. 10,

Fig. 12 is a longitudinal section through a floor member constructed in accordance with a further development of the invention,

Fig. 13 is a plan view of the floor member illustrated in Fig. 12,

Fig. 14 is a section taken on the line XIV—XIV in Fig. 12 and

Fig. 15 is a flap arrangement at the outlet opening of the container.

In the embodiment shown in Figs. 1 to 3 two cylindrical containers 1 are secured on a base frame 2 and additionally supported by stays 3. The base frame can be mounted on a vehicle together with the containers. Each container 1 is in the form of a horizontally disposed cylinder whose cylinder casing in its lower region is constructed in the form of a V-shaped, downwardly drawn, conical extension 1a closed at the bottom.

Two floor members 5a, 5b arranged one behind the other in the longitudinal direction of the containers are arranged within the V-shaped lower part 1a of each container and a separating plate 11 is provided between the upper edge of the floor member 5b and the bottom of the container. An air injection pipe 4a, 4b has an outlet below each floor member 5a, 5b, and a discharge pipe 6a, 6b is conducted out of the container in front of the bottom end of each floor member 5a, 5b. The two discharge pipes are combined into a common discharge connection piece 8, as illustrated particularly in Fig. 3. A control flap 7 by which one of the respective discharge pipes can be closed is mounted in the discharge connection piece 8. This is advantageous in that the flowable solid above each floor member can be discharged according to the position of the control flap. This ensures complete emptying of the container.

Various possibilities for arranging the floor members 5 are illustrated in Figs. 4 and 5. The air injection pipes and the discharge pipes are respectively designated 4 and 6. A special embodiment of the floor members is illustrated in section in Fig. 6, drawn to a larger scale. The floor member illustrated is provided with a perforated plate 12 having a filter 13 arranged thereon which is covered by a slotted plate 14. It is optional whether the positive or the negative stamped side of the slotted plate 14 abuts against the filter. The air flow through in the manner indicated by the arrow A.

As illustrated by dashed lines in Figs. 2, 4 and 5, the container can be provided with a vertical partition 10 between the floor members, so that different products can be transported in one container. In order to improve the transporting of flowable solid products through the longer discharge pipe 6a (Fig. 2) and the discharge pipe 6 (Figs. 4 and 5) an additional air injection pipe 9 is inserted into them through which additional air can be blown into the discharge pipe 6 or 6a during the emptying operation.

Different constructions of the floor members are illustrated in Figs. 7 to 11. In Fig. 7, the container 1 is again mounted on a support frame 2. A floor member 23 of stepped construction is arranged in the container above the bottom thereof and provided with air flow-through openings through which air blown in at the bottom through the container air inlet connection piece 24 passes upwardly into the container and thus conveys the flowable solid to the outlet connection piece 25. A flap 26 is pivotally mounted on the rear edge of the floor member in the vicinity of the outlet connection piece 25 and may be adjusted upwardly or downwardly for the purpose of obtaining different operating states.

An embodiment of the floor member is illustrated in Figs. 8 and 9, drawn to a larger scale. The floor member 23a comprises separate, rectangular sheet metal ribs 26 one of the longer edges of each of which ribs is folded back on itself. The edge portion of each rib parallel to the folded edge is bent so that, viewed from the centre of

the sheet metal rib, it first of all extends upwardly, to form a step, then parallel to the folded edge of the rib, and finally obliquely downwardly. The bent edge portion of each sheet metal rib and the folded edge of each adjacent rib overlap each other. Two sheet metal ribs 27 arranged at a distance from each other are inserted between the portion 26b and the edge of the next sheet metal rib (Fig. 9), so that three air flow-through slots 28 are formed. The blast air is conducted through the air flow-through slots 28 and thereby directionally guided in conformity with the parallel portions of the sheet metal ribs in the region of overlap.

Figs. 10 and 11 illustrate a further embodiment of the floor member. Here, the floor member 23b comprises a continuous sheet bent in the form of steps. Air guide pipes 31 are inserted into bores located adjacent to each other in the substantially vertical step portions 30. The compressed air flows through the air guide pipes and is directionally guided corresponding to the position of the pipes.

Another embodiment of the floor member is illustrated in Figs. 12 to 14. Fig. 12 illustrates the bottom region of a container 1 having a floor member 33 which is again provided with air flow-through openings 34. The air flow-through openings are provided wih air deflectors 35 which, in the present embodiment, are in the form of local, bead-shaped bulges in the floor member, although they may be of any other suitable construction. The air flows from the air inlet connection piece 36 through an opening 36a in the container and into the region between the bottom 32 and the floor member 33, and then to the upper side of the floor member 33 through the air flow-through openings 34. The air deflectors 35 are arranged on both sides of the longitudinal axis X at a distance therefrom and at an acute angle thereto. In the embodiment illustrated the angle is 10°.

A substantially parabolic air hood 37 is mounted on the end of the sieve bottom 33 facing the air inlet connection piece 36. The rear of the air hood is connected to the air inlet connection piece 36 by way of an opening 36b in the wall of the container. In the same manner as the floor member, the hood is provided with a plurality of air flow-through openings 34 having air deflectors 35. Outlet openings 38a, 38b for the mixture of flowable solid and air and for the surplus air are provided in the wall of the container 1 at the other end of the floor member and, in a manner not illustrated, provided with shut-off flaps or the like.

Fig. 15 illustrates a preferred flap arrangement for a container having an outlet opening located at the bottom. Here, the container 1 is again provided with two floor members 42a, 42b which slop downwardly from the sides t the centre. The cavities located beneath the floor members are connected to air inlet connection pieces (not illustrated).

An outlet opening A for the air flowable solid mixture is located between the bottom edges of the floor members 42a, 42b in the container 1. A box-like container extension 53 is secured to the underside of the container in the region of the outlet opening. Two flaps 55, 56 extending at an obtuse angle to each other are secured to a shaft 54 journalled horizontally in the container extension. This angle is about 150° in the present embodiment. The flaps are arranged so that, in the closed position, the one flap 55 closes the outlet opening A, and the other flap 56 closes an air outlet opening B which is located beneath the sieve bottom 42a and defined above by the shaft 54 and below by a sheet metal plate 57.

A smaller flap 50 which is secured to a horizontal shaft 49 and closes a second air outlet opening C is arranged below the other floor member 42b on the other side of the outlet opening A. The one side of the air outlet opening C is defined by the shaft 49, and the other side by a sheet metal plate 52. The sheet metal plate 52 extends to to outlet opening A where it forms an angled tongue 52a serving as a stop for the flop 55. The outlet opening D for the air flowable solid mixture is located in the side of the container extension 53 below the flap 50.

The shafts 54 and 49 are actuated externally by handles (not illustrated). When the outlet opening A for the air flowable solid mixture is opened, the simultaneously pivoting flap 56 opens the air outlet opening B to a greater or lesser degree. Thus additional accelerating air passes from here into the lower part of the container extension, so that the discharge operation is accelerated. If required, the air outlet opening C can be additionally opened by pivoting the flap 50 upwardly, so that additional accelerating air flows into the container extension.

WHAT I CLAIM IS:—

1. A container for transporting, in bulk, products in the form of flowable solids, such as grain, fodder, flour, pellets or the like on vehicles, and having an arrangement for emptying the container with the aid of compressed air, comprising at least one reticulate floor member provided with air flow-through openings, an air injection pipe and a discharge pipe; said container having a top in the form of a horizontally disposed cylinder and having a bottom in the form of a downwardly drawn, truncated cone which is "V" shaped in any vertical section through the central axis thereof.

2. A container as claimed in claim 1, in which two floor members are arranged one behind the other, and in which an air injection pipe and a discharge pipe are associated with each floor member.

3. A container as claimed in claim 2, in which the two discharge pipes are combined into one discharge connection piece which is provided with a control flap pivotable in front of the mouths of the discharge pipes.

4. A container as claimed in any preceding claim, in which the or each floor member comprises a perforated plate covered by a filter which itself is covered by a slotted plate.

5. A container as claimed in any preceding claim, in which the air flow-through openings in the or each floor member have air deflectors which influence the direction of the out-flowing air.

6. A container as claimed in claim 5, in which the or each floor member is assembled from transverse, overlapping sheet metal ribs, the edge portions of the sheet metal ribs forming air nozzles in the region of overlap by parallel top and bottom surfaces.

7. A container as claimed in claim 5, in which the or each floor member comprises a continuous plate bent in the form of steps, and in which air guide pipes are inserted into bores which are located in the substantially vertical step portions and arranged side by side.

8. A container as claimed in claim 5, in which the air flow-through openings are arranged on both sides of the longitudinal axis of the or each floor member and extend at an acute angle to the longitudinal axis.

9. A container as claimed in claim 8, in which n air flow-through openings are provided on one longitudinal sector in the region of the longitudinal axis of the or each floor member.

10. A container as claimed in any one of the preceding claims, in which air flow-through openings located at a distance above the or each floor member are provided at the air inlet end of the or each floor member.

11. A container as claimed in any one of the preceding claims, in which a flap pivotable about a horizontal axis is arranged below the container outlet opening for the product-air mixture and connected to a second flap arranged at an obtuse angle thereto, which second flap opens an air outlet opening for conducting accelerating air into the air-product mixture emerging from the outlet opening.

12. A container as claimed in claim 11, in which a smaller flap pivotable about a horizontal axis is arranged on the side of the outlet opening remote from the second flap and opens a second air outlet opening for the purpose of conducting accelerating air into the air-product mixture.

13. A container constructed and arranged and adapted to be used substantially as hereinbefore particularly described with reference to and as illustrated in the accompanying drawings.

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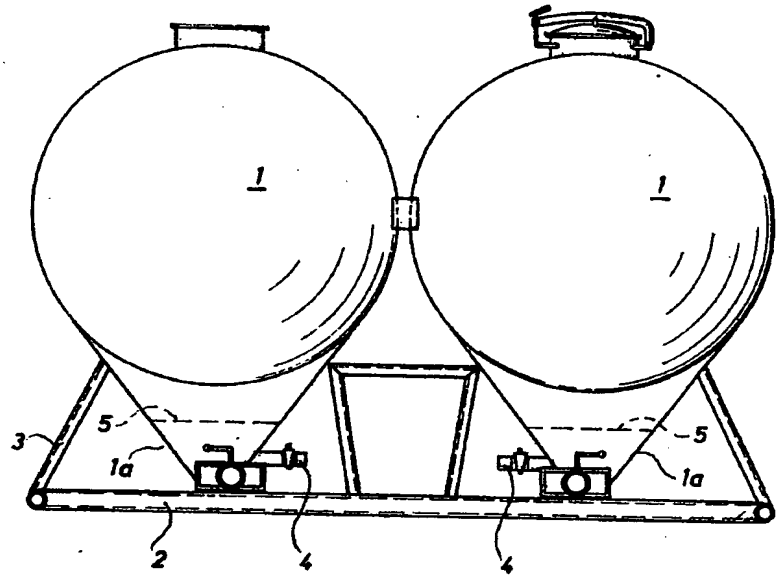

FIG. 1

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Sheet 2

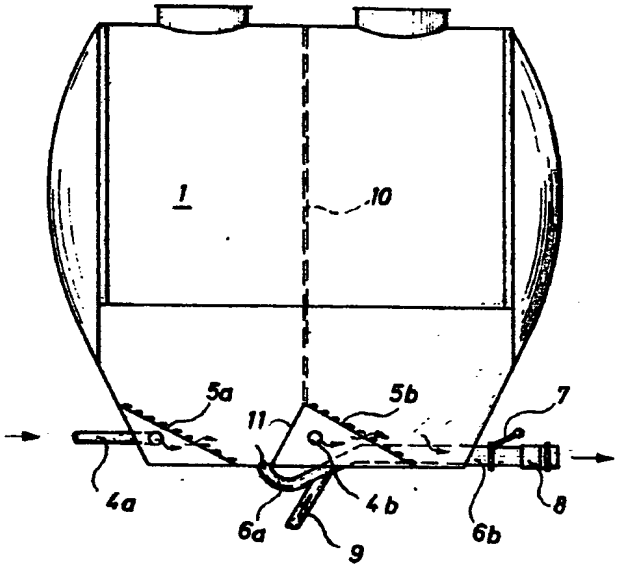

FIG. 2

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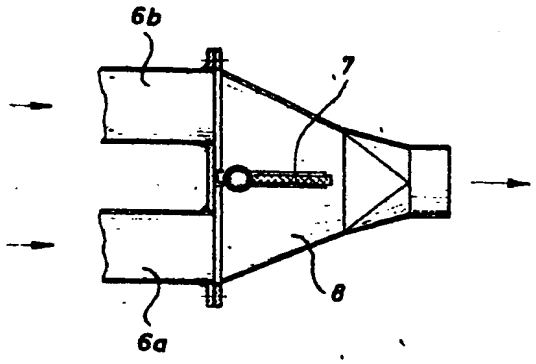

FIG. 3

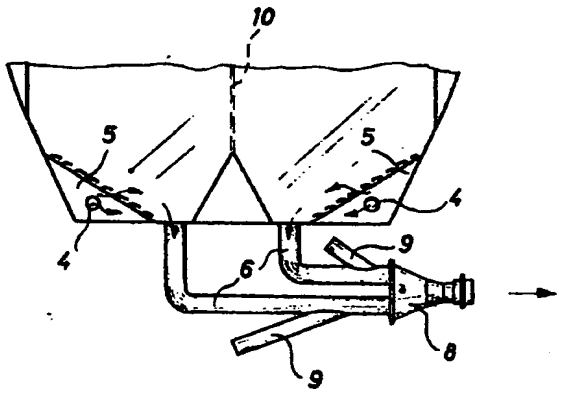

FIG. 4

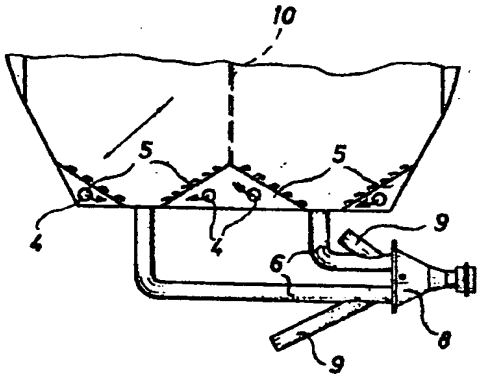

FIG. 5

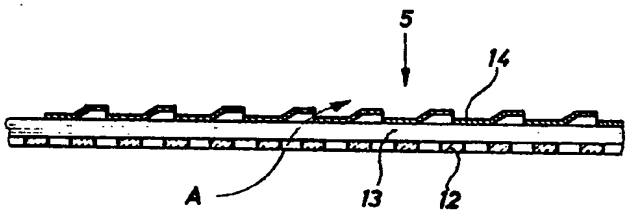

FIG. 6

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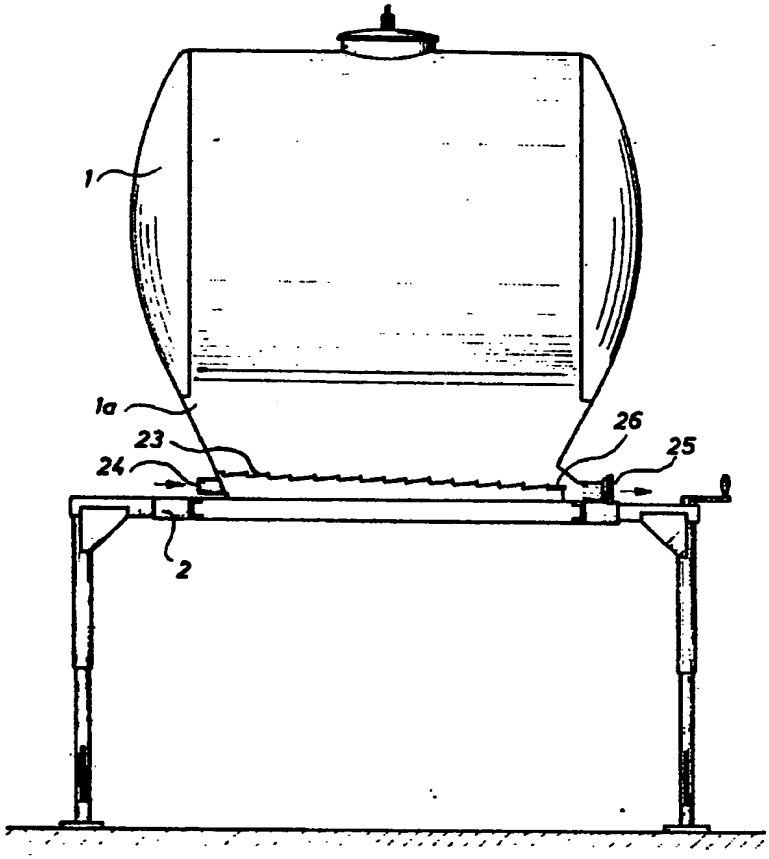

FIG. 7

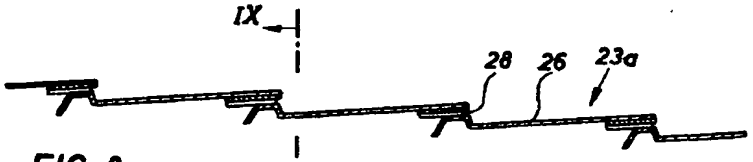

FIG. 8

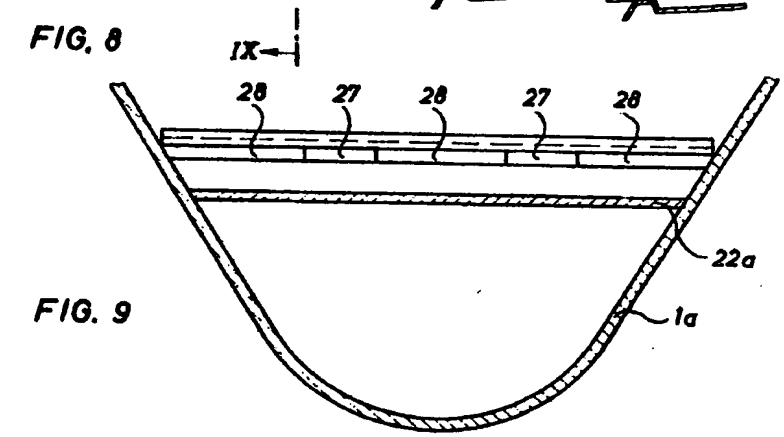

FIG. 9

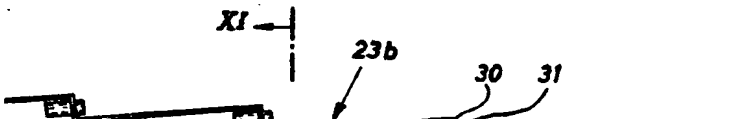

FIG. 10

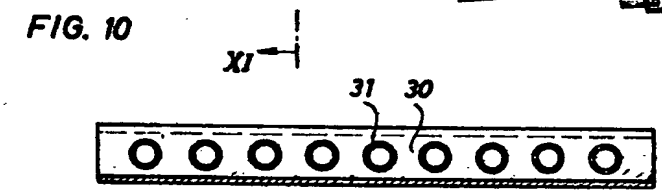

FIG. 11

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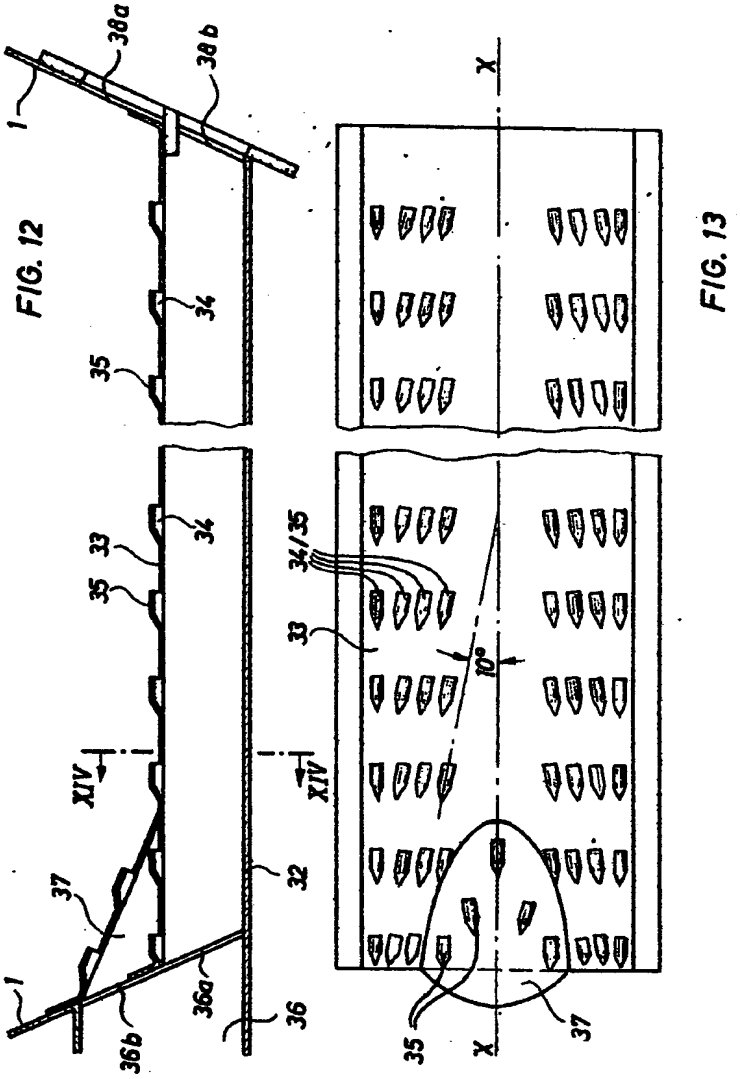

FIG. 12

FIG. 13

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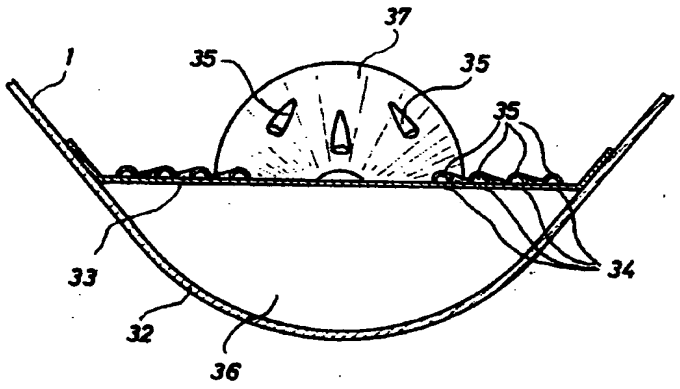

FIG. 14

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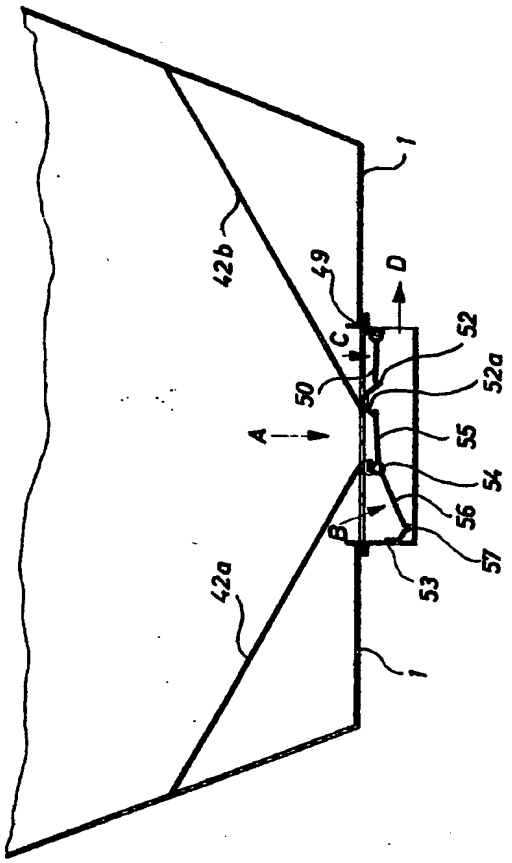

FIG. 15